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ATMOSPHERE

Atmosphere:

It is a mixture of numerous gases which surrounds the earth from all sides and is held to the earth's gravitational attraction and rotates with it. It is an important component of the ecosystem because it supports the life on the earth.

Composition of the Atmosphere:

- About 97% of the air is concentrated in the lower 29 Km.

<u>Gas name</u>	<u>Volume (%)</u>
Nitrogen	78.03
Oxygen	20.99
Argon	0.932
Carbon dioxide	0.03
Neon	0.0018
Helium	0.0005
Hydrogen	0.00005
Xenon	0.0000087

Nitrogen (N_2):

- It is chemically inactive and acts as a diluent.
- It is the main component in amino acids.
- Nitrogen in the atmosphere cannot be utilized directly by living organism.
- Some microorganisms are there who can convert the atmospheric nitrogen to nitrogenous compounds, the utilizable form of nitrogen.

- Leguminous plants play an important role in this process.

Oxygen(O_2):

- It is highly active chemically.
- It is the main element for the process oxidation.
- Living tissues require oxygen to convert food into energy.

Carbon dioxide (CO_2):

- It is a greenhouse gas and absorbs the radiant heat passing through the atmosphere from the earth, thus it adds to the warming of lower atmosphere and contributes to global warming.
- CO_2 is also used by green plants in the process of photosynthesis.

Water vapor:

- It is the gaseous form of water.
- Like CO_2 , it is a good absorber of heat radiation and plays a major role in warming the lower atmosphere.

Particulate matter:

- Most of the solid particles present in the atmosphere like dusts particles, sand particles, pollen, smoke and soot etc. constitute the particulate matter.
- The sky appears blue due to scattering of solar radiation by dust particles. Salt particles become hygroscopic nuclei water drops, clouds and various forms of condensation and precipitation.

Structure of the Atmosphere:

Based on the temperature, the atmosphere is divided into **five layers**. These are;

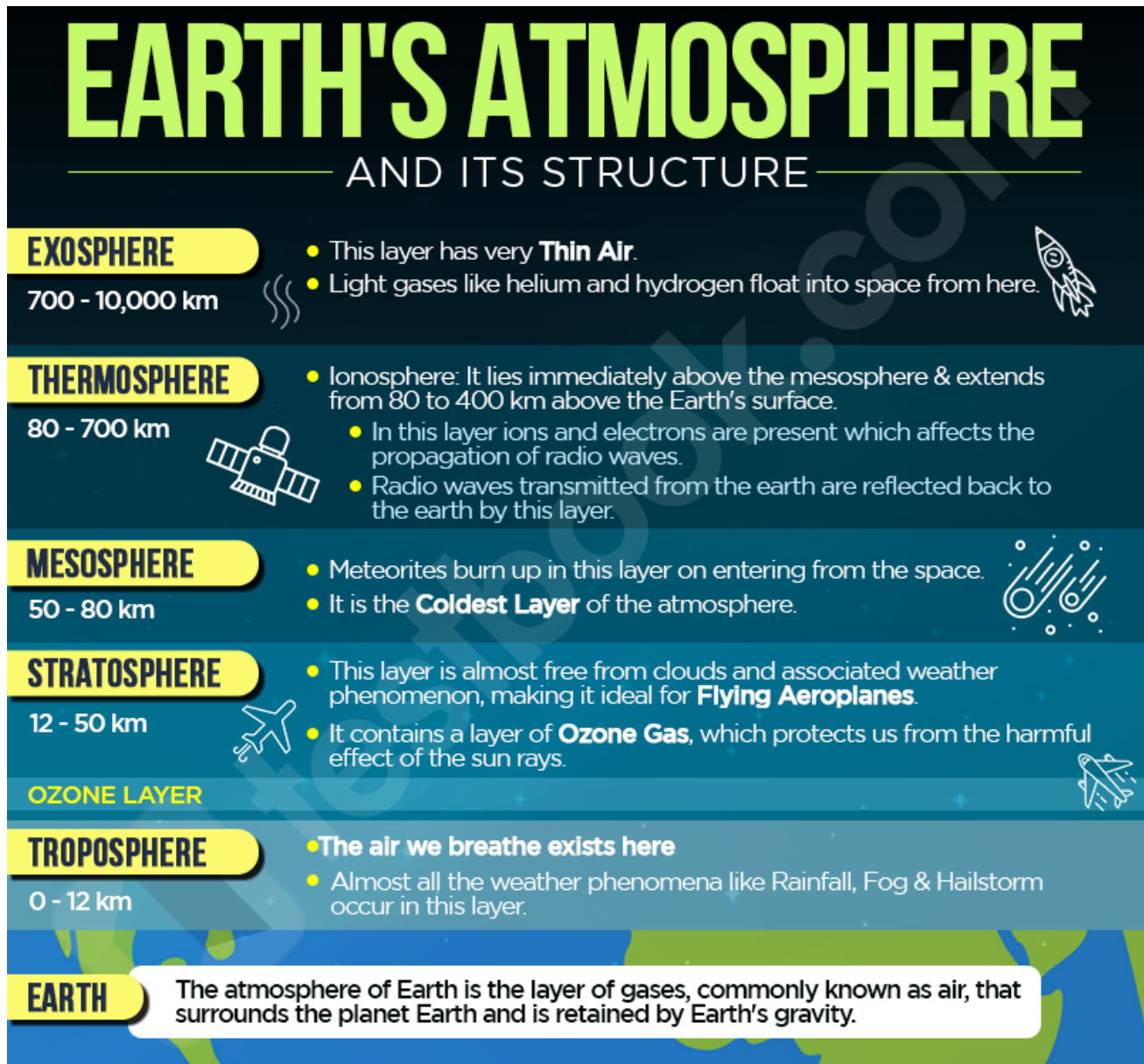
- Troposphere.
- Stratosphere
- Mesosphere.
- Thermosphere
- Exosphere

Troposphere:

- The lowest layer of the atmosphere is Troposphere.
- It is the most important layer because almost all the weather phenomenon (Cloud, fog, frost, rainfall, hailstorm etc.,) occurs in this layer.
- The most important feature of this layer is that there is a decrease of temperature with increasing elevation at a normal lapse rate of 6.5°C per kilometre or 1°C per 165 cm.
- Under normal conditions, the height of the troposphere at poles is about 8 Km while at the equator it is about 16 Km.
- Another important characteristic of this layer is that wind velocities increase with height and attain the maximum at the top.
- At the top of the troposphere there is a shallow layer called tropopause, which is a zone of transition between the troposphere.

Stratosphere:

- Stratosphere lies just above the troposphere, extending to a height of 50 Km, from a height of about 16 Km at the equator and 8Km at the poles.
- The character in the lower part of the stratosphere is isothermal (No change in temperature with altitude).
- This layer is non - convective and stratified in nature i.e. it is stable Due to this, it is the most suitable layer for the flight of the jet planes.
- Cirrus clouds, called the mother of pearl clouds, occasionally form in the lower stratosphere.
- One important feature of stratosphere is that it contains ozone layer, which is confined between the height of 15 Km to 35 Km. The ozone layer absorbs solar ultraviolet rays and thus shields life on earth from harmful UV rays. The warming of the stratosphere with altitude is caused due the absorption of solar energy by Ozone molecules.
- The upper limit of stratosphere is known as stratopause.



Mesosphere:

- It lies between 50 Km and 80 Km above the earth's surface, it is bounded by stratopause (Below) and mesopause (Above).
- Temperature decreases with increasing height. Within it the temperature decreases from 0° C at the stratopause to -90° C at the mesopause.

Thermosphere:

- The part of the atmosphere beyond the mesopause is called thermosphere, where the temperature increases rapidly with increasing height.
- Thermosphere is divided into two layers.
- Ionosphere
- It extends from 80 Km to 640 Km.
- The temperature increases in this layer with increase in height.
- **Ionosphere** reflects the radio waves.
- The ionosphere consists of the following layers (with increasing height)
 - **D layer** (60-99 Km) - reflects low frequency radio - waves but absorbs medium and high frequency waves. It is associated with solar radiation., therefore, it disappears with the sunset.
 - **E layer** (Kennelly - Heavyside layer) (99Km - 130 Km): It reflects medium and high frequency radio waves.
 - **Sporadic E layer** (110 Km) - It is associated with high velocity winds and reflects high frequency radio waves.
 - **E2 layer** (150 Km) - It is produced by ultra - violet photons acting upon oxygen molecules. It appears during daytime and vanishes at the sunset.
 - **F layer** (150 - 380 Km) - It consists of two sub - layers and are collectively called Appleton layer. It reflects medium and high frequency radio waves.
 - **G layers** (400 Km and above) - It persists day and night but is not detectable.

Exosphere:

- The outermost layer of the earth's atmosphere is known as the exosphere. It lies at a height between 400 to 1000 Km.
- The density at such a height is extremely low and rarefied and the atmosphere resembles a nebula.
- The temperature is 5568° C at the outer limit, but it is never felt.

Radiation belts:

- In the upper part of the atmosphere the gases start getting ionized.
- These ionized particles increase in frequency with increasing height.
- Two belts in the upper atmosphere having a high concentration of ionized particles, known as the Van Allen's Radiation belts.
- These two belts hold the incoming protons and electrons and protect the earth from these high energy particles.

Aurora and Magnetic storms:

- Aurora is a luminous phenomenon observed in the atmosphere in high latitude regions. When charged particles from the sun enter the earth's magnetic field, the aurora is produced.
- The auroras are visible both in the northern and southern hemispheres. The aurora in the northern hemisphere is called **Aurora Borealis (Northern lights)** and the one in southern hemisphere is called **Aurora Australis (Southern lights)**.
- They are frequently visible in the areas about 20° from magnetic poles, in areas like north Canada, northern Russia and Greenland.
- The auroras have an inverse relationship with the solar activity.
- When the solar cycle is at its lowest, the auroras are the strongest and vice versa.

Magnetic Storms:

- These are temporary disturbances in the earth's magnetic field which are caused by the occurrence of solar flares and sunspots.
- They disrupt the radio and telegraphic communications and magnetic surveys.